34. The system of claim 33 further comprising a central nozzle substantially centered relative to the width of the deposition zone and at least one end nozzle on each side of the central nozzle.

35. The system of claim 31, wherein the orifice diameter of each nozzle is within the range of about 0.25-cm. to about 2.5-cm., and the orifice length of each nozzle is within the range of about 0.25-cm. to about 2.5-cm.--

REMARKS

Please reconsider the application in view of the amendments and following remarks. Prior to this amendment, claims 1-29 were pending in the application. In the Office action mailed on January 28, 2002, claim 20 was rejected under 35 U.S.C. § 112, and claims 1-29 were rejected under 35 U.S.C. § 102 and/or § 103. Applicants have responded by amending claims 1-29 and adding new claims 30-35 which are all believed to be patentable over the art of record, as discussed below.

Applicants' claimed effusion system is different from any of the effusion devices shown in the references of record at least in the sense that the claimed effusion system is used to deposit source material uniformly on an elongate substrate that translates through a deposition zone over an effusion source. A significant aspect of applicants' invention involves innovation to assure that a source material is deposited precisely, and uniformly across the width, and along the length of the substrate. None of the art of record, alone, or in any combination, teaches or suggests the claimed effusion system.

35 U.S.C. § 112

The Examiner rejected claim 20 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicants regard as the invention. The Examiner indicated that there is no antecedent basis for "the lid." Applicants amended independent claim 18 to provide antecedent basis for "the lid" in dependent claim 20. All of the pending claims comply fully with 35 U.S.C. § 112.

35 U.S.C. § 102

The Examiner rejected claims 1, 6, 7, 9-11, 13-15, and 17-21 under 35 U.S.C. § 102(b) in view of Chow, and claims 26-27 in view of Colombo. Applicants believe the claims, as amended, are not anticipated by Chow, Colombo or any of the references of record.

A rejection under 35 U.S.C. § 102 requires that each and every element of the rejected claim(s) be contained in a single prior art reference. The rejected claims include elements that are not contained in any single prior art reference. Specifically, applicants amended independent claims 1, 18, and 26 to include a device for translating strip material through a deposition zone, and to clarify features of the nozzle and/or crucible design and arrangement that allow uniform deposition across the width of the deposition zone. Support for the amendments relating to the device for translating strip material can be found in Figures 1,5, and 6 and in associated text in the specification. Support for the amendments relating to nozzle configurations can be found in Figures 6, 12, 13, 16-19, and the text on page 28, line 5 through page 39, line 11.

Independent claims 1, 18, and 26, and claims 6, 7, 9, 11, 13-15, 17, 19-21, and 27 that depend from the independent claims, are patentable because Chow, Colombo, and the other references of record do not teach or suggest a vapor deposition system that includes a device for translating strip material and a nozzle configuration that provides uniform deposition across the width of the deposition zone. The crucible top shown in Chow has an approximately circular array of holes which would not deposit a uniform amount of source material across the width of an elongate strip, and thus could not achieve transverse uniformity, as with the claimed invention. Apparently, Chow's crucible would deposit more material toward the center of the strip in comparison to the sides. Moreover, neither Chow or Colombo teaches or suggests anything about nozzle arrangement, configurations, or geometry, as claimed. Therefore, none of the pending claims, as amended, are anticipated by Chow or Colombo.

35 U.S.C. § 103

The Examiner rejected claims 2-5, 12, 16, and 22-24 under 35 U.S.C. § 103(a) as being unpatentable over Chow in view of Colombo or Swindt; claims 8 and 25 as being unpatentable over Chow in view of Colombo or Swindt, and further in view of Finicle; claim 28 as being unpatentable over Colombo in view of Swindt; and claim 29 as being unpatentable over Colombo in view of Chow. Applicants believe that all of the pending claims, as amended, are patentable over the art of record.

As already explained, none of the references of record, particularly Chow, Colombo, Swindt, and Finicle, teach or suggest anything about an effusion system including a device that translates a strip material through a deposition zone, and which

includes one or more nozzles configured and arranged to deposit source material uniformally across the strip. Accordingly, these references cannot be combined to produce the claimed invention.

Added Claims

New claims 30-35 are directed to important patentable features of the nozzle configuration which help to produce uniform deposition across the width of the deposition zone. Support for the claims may be found in pp. 32-42 of the disclosure.

Conclusion

In view of the foregoing, it is respectfully asserted that all of the claims pending in the application, as amended, are in condition for allowance. If the Examiner has any questions, he is invited to contact the undersigned at (503) 224-6655. Reconsideration of the application and prompt allowance of all the claims is respectfully requested.

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Box AMENDMENT FEE, Commissioner for Patents, Washington, D.C. 20231 on July 29, 2002.

Anita R. Tabayoyon
Date of Signature: July 29, 2002

Respectfully submitted,

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

Please amend the following claims:

1. (Amended) A vapor deposition effusion [source] system, comprising:

a device adapted to translate a strip material through a deposition zone and along a processing path, each of the strip material and the deposition zone having a width oriented perpendicular to the processing path;

a substantially closed vessel adapted to contain a heated quantity of source material, the vessel including [at least one] an array of vapor delivery nozzles distributed uniformly across the vessel in a direction corresponding to the width of the deposition zone and configured [adapted] to expel [a] overlapping plumes of source material, so that a fog of source material of substantially uniform flux is created and deposited on the strip material; and

a heating system adapted to maintain the nozzle at a temperature higher than the source material.

2. (Amended) The [source] system of claim 1 further comprising a thermal control shield disposed around at least partially around the vessel.

3. (Amended) The [source] system of claim 2, wherein the thermal control shield includes an outer shell and plural insulation layers.

4. (Amended) The [source] system of claim 3, wherein the outer shell is formed of one or more materials chosen from the following group: graphite, boron nitride, tantalum, molybdenum, tungsten, rhenium and titanium.

5. (Amended) The [source] system of claim 4, wherein the outer shell is ceramic coated.

6. (Amended) The [source] system of claim 1, wherein the vessel includes plural spaced-apart vapor delivery nozzles.

7. (Amended) The [source] system of claim 6, wherein the nozzles are disposed along an elongate axis configured to expel overlapping plumes of source material, whereby a fog of source material of substantially uniform flux along the elongate axis is created.

8. (Amended) The [source] system of claim 6, wherein the vessel is constructed of materials chosen from the group consisting of graphite, pyrolitic boron nitride coated graphite, tantalum, molybdenum, tungsten and ceramics.

9. (Amended) The [source] system of claim 1, wherein the vessel includes a crucible and a lid, wherein the at least one vapor delivery nozzle is positioned in the lid.

10. (Amended) The [source] system of claim 9, wherein the at least one nozzle is integrally formed into the lid.

11. (Amended) The [source] system of claim 9, wherein there are plural nozzles positioned on the lid.

12. (Amended) The [source] system of claim 11, wherein the nozzles are spaced apart between 1 and 20 centimeters.

13. (Amended) The [source] system of claim 9, wherein the heating system includes an electrical heating element disposed in the lid.

14. (Amended) The [source] system of claim 13, wherein the heating element disposed in the lid is generally U-shaped.

15. (Amended) The [source] system of claim 9, wherein the heating system is adapted to maintain the lid at a temperature higher than the source material.

16. (Amended) The [source] system of claim 1, wherein the at least one nozzle has a discharge opening between 0.25 and 2.5 centimeters in diameter.

17. (Amended) The [source] system of claim 1, wherein the heating system includes at least one U-shaped heating element.

18. (Amended) A vapor deposition [source] system, comprising:

a roll assembly configured to translate a strip material through a deposition zone and along a processing path, each of the strip material and the deposition zone having a width oriented perpendicular to the processing path;

a crucible and a lid configured to hold a quantity of molten constituent material; [and]

at least one nozzle positioned in the lid to pass vapor evaporated from the molten constituent material out of the crucible; and

a source material heating system to control the temperature of the source material at a desired temperature range;

wherein the roll assembly is configured to maintain a substantially constant travel speed of the strip material through the deposition zone in relation to the temperature of source material in the crucible, such that source material of substantially uniform flux is created and deposited on the strip material.

19. (Amended) The [source] system of claim 18 further comprising a nozzle heating system adapted to maintain the nozzle at a temperature above the temperature of the constituent material.

20. (Amended) The [source] system of claim 19, wherein the nozzle heating system is configured to maintain the lid at a temperature above the temperature of the constituent material.

21. (Amended) The [source] system of claim 18, wherein in the nozzle is sized to constitute the rate limiting factor in effusion of the vapor.

22. (Amended) The [source] system of claim 18, wherein the nozzle has an opening area between 0.05 and 5 square centimeters.

23. (Amended) The [source] system of claim 18[,] further comprising a thermal control shield at least partially surrounding the crucible.

24. (Amended) The [source] system of claim 18, wherein the thermal control shield includes an outer shell and thermal insulation.

25. (Amended) The [source] system of claim 18, wherein the crucible is constructed from materials chosen from the following group: graphite, pyrolitic boron nitride coated graphite, tantalum, molybdenum, tungsten and ceramics.

26. (Amended) A vapor deposition [source] system, comprising:

a device adapted to translate a strip material through a deposition zone and along a processing path, each of the strip material and the deposition zone having a width oriented perpendicular to the processing path;

a substantially closed vessel adapted to contain a heated quantity of source

material, the vessel including an effusion side with at least one vapor delivery nozzle adapted to expel a plume of source material; and

a thermal control shield [configured to] substantially covering the effusion side of the vessel, except for an area adjacent the at least one nozzle, the shield being configured to protect the strip material from excessive thermal radiation, to optimize reaction of the source material deposited on the strip material, and to avoid undesired condensation on the strip material [to block thermal radiation from the vessel from reaching a substrate onto which the constituent material is to be deposited].

27. (Amended) The [source] system of claim 26, wherein the thermal control shield substantially encloses the vessel.

28. (Amended) The [source] system of claim 26, wherein the thermal control shield includes an outer shell and a thermal insulation layer.

29. (Amended) The [source] system of claim 26 further comprising a heating system adapted to maintain the at least one nozzle at a temperature higher than the temperature of the constituent material.